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Magneto-Elastic Anisotropy in Ultra-Thin Films of Fe(110)/W(110)

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Beamline: U5UA

Introduction: Often ultra-thin films embed a considerable amount of stress due to the epitaxial growth on the single crystal substrate. In this condition, it is important to investigate the magneto-elastic anisotropy induced in magnetic ultra thin film.

Method and Materials: The magneto-elastic anisotropy of Fe(110)/W(110) films has been investigated using spin-resolved photoemission at the U5UA beamline. For this purpose, epitaxial films of Fe, FeV, FeCo, and FeNi have been grown *in-situ* on a W(110) single crystal by electron beam evaporation.

Results: The lattice of ultra-thin Fe films can be modified (expansion or contraction) by appropriate substitution of Fe with neighboring atoms (chemical pressure). This effect is shown in Fig. 1, where the in-plane lattice constant of diluted Fe alloys is reported as a function of concentration. The lattice constant has been measured in-situ using Low Energy Electron Diffraction. These lattice modifications introduce a large magnetic anisotropy in the Fe ultra-thin films. This effect can be appreciated by observing the corresponding large shifts induced in the Fe(110) critical reorientation thickness. (Fig.2)

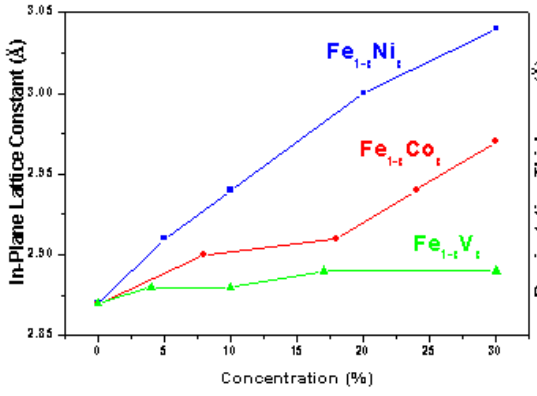

Fig.1

Figure 1. shows the in-plain lattice constant change as functions of various alloy films.

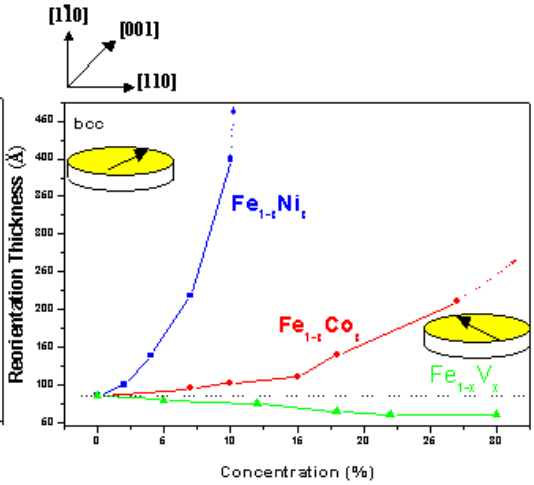

Fig.2

Figure 2. displays reorientation thickness change as functions of various alloy films.